0035


# State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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September 29, 1999

TO: File

THRU: Daron Haddock, Permit Supervisor

THRU: Dave Darby, Team Lead

FROM: Robert Davidson, Soils Reclamation Specialist

RE: Soils Technical Analysis of the Permit Application Package, Utah American Energy, Inc., Lila Canyon Mine, ACT/007/013-SR98-1, File #2, Carbon County, Utah

**SUMMARY:**

The most recent re-submission was received on July 30, 1999. This second round of Technical Analysis for soils is in response to the most recent submittal. The chronology for the Lila Canyon Mine Permit Application Package (PAP) is as follows:

| Action | Date |
|---|---|
| Original PAP submittal | September 8, 1998 |
| Administratively incomplete, PAP returned | November 6, 1998 |
| Re-submittal | December 14, 1998 |
| Administratively incomplete | February 1, 1999 |
| Re-submittal | February 11, 1999 |
| Administratively Complete | February 25, 1999 |
| 1st round - Technical Analysis w/ deficiencies | May 26, 1999 |
| Re-submittal | July 30, 1999 |

**TECHNICAL ANALYSIS:**

# ENVIRONMENTAL RESOURCE INFORMATION

## SOILS RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 783.21, 817.200(c); R645-301-220, -301-411.

**Analysis:**

Chapter 2, Soils, Sections 210 through 224, discusses the soil resources within the proposed Lila Canyon Mine. Relevant soils information includes prime farmland investigation, current and published soil surveys, soil characterizations, and substitute topsoil identification. The Analysis section discusses resource information as follows:

- Prime Farmland Investigation
- Soil Survey Information
- Soil Characterization
- Substitute Topsoil

### Prime Farmland Investigation

A Prime Farmland site investigation was performed by the Natural Resources Conservation Service (NRCS). A determination was made that no Prime Farmland or farmland of statewide importance were found within the proposed Lila Canyon coal lease area and support facilities area because there is no developed irrigation system on arid soils. The determination letter from the NRCS dated June 8, 1998, was sent to Environmental Industrial Services and is included in Appendix 2-1.

### Soil Survey Information

The soil survey information contains both general and site specific surveys as follows:

*(1) General, Third Order Soil Survey*

Appendix 2-2 and Soils Map 2-1 make up the general Order 3 soil survey. The unpublished Order 3 soil survey for Emery County is currently in progress by the U. S. Department of Agriculture, Natural Resource Conservation Service (NRCS). Portions of the Order 3 soil survey relevant to the Lila Canyon Mine project has been provided by the NRCS. The soil map (Plate 2-1) is scaled at 1:24,000 and includes map unit descriptions.

The Order 3 soil survey information provided by the NRCS identifies four soil mapping

units located within the mine surface facilities area as:

- BNE2 Strych very bouldery, fine sandy loam, 3 to 20 % slopes
- BMD Strych very stony fine sandy loam, 3 to 30 % slopes
- NGG2 Gerst-Strych-Badland complex, 30 to 70 % slopes
- RZH Rock Outcrop-Atchee-Rubbleland Complex

In addition, the Order 3 soil survey (Appendix 2-2) and soil map (Plate 2-1) provide identities and information on the following soil mapping units as located within Permit Area "B" for Lila Canyon boundary as follows:

- DHG2 Comodore-Datino Complex
- DSG 2 (HUG) Midfork-Tingey-Comodore Complex
- GNA Neto fine sandy loam
- KXH Podo-Rock outcrop Complex
- MHE (MSC) Podo sandy loam, 1 to 8 percent slopes
- MRG Vassilla-Rock outcrop-Gerst Association
- MTH Cabba-Guben-Rock outcrop Complex
- MUE Cabba-Podo-Doney Complex
- NGG2 Gerst-Strych-Badland Complex
- NVF2 Gerst-Rubbleland-Badland
- NXC Lazear-Rock outcrop Complex, high rainfall
- RR Rock outcrop
- RWG Rock outcrop-Rubbleland-Vassilla Complex
- RZH** Rock outcrop-Atchee-Rubbleland Complex
- UMF2 Guben-Pathead-Rabbitex Association
- VOH Guben-Rock outcrop Complex

**Appendix 2-2 does not contain information for the RZH soil.

Appendix 2-2 also provides typical soil pedon and soil descriptions for the following Soil Series: Atchee, Cabba, Comodore, Datino, Doney, Gerst, Guben, Lazear, Midfork, Neto, Pathead, Pinon, Podo, Rabbitex, Strych, Tingey, and Travessilla.

*(2) Site specific, First Order Soil Surveys*

In August 1998, a site specific Order 1 soil survey for the surface facilities area was performed and prepared by Mr. Daniel Larsen, Soil Scientist, Environmental Industrial Services (Appendix 2-3). The survey contains soil descriptions, soil pedon descriptions, soil salvage suitability analysis, laboratory soil testing data, field soil profile descriptions, soil and landscape photographs, soils map, and salvageable soils map. The detailed soil survey of the surface facilities site identifies six soil map units as follows:

- SBG Strych boulder fine sandy loam, 5 to 15 % slopes
- VBJ Strych very bouldery fine sandy loam, 5 to 15 % slopes
- XBS Strych extremely bouldery sandy loam, 10 to 45 % slopes
- RBL Rubbleland-Strych-Gerst complex, 20 to 70 % slopes
- DSH Strych fine sandy loam variant, 3 to 8 % slopes
- RBT Rock outcrop - Travessilla family complex

All mapping and soil survey work were performed according to the standards of the National Cooperative Soil Survey. Based on the site-specific soil descriptions, and laboratory data, each of the soils were classified according to current, unpublished NRCS soil taxonomy, and correlated to specific soil series names. The RBT soil unit references the Travessilla family complex; however, the Travessilla family has been revised by NRCS and based on changes, the Atchee series is more appropriate to Map Unit RBT (Based on personal conversation to Dan Larsen with Leland Sassar, July 1999). *The Order 1 soil survey map has discontinuous 25 feet contour lines within the surface disturbance area.*

Soil productivity of existing soils was determined by Mr. George Cook from the Natural Resources Conservation Services and results are shown in Appendix 3-7.

An addendum has been attached to Appendix 2-3 to include the Lila Canyon Mine, proposed portal fan site soil evaluation. Two soil descriptions were taken at the site and include pits LC11 and LC12. Rating of soil suitability criteria shows good ratings, except for water holding capacity with a poor rating. Average depth of soil is about 15 inches, with a range of about three feet to zero. The deeper soils are at the upper edge of the bench which grade to bedrock sandstone at the lower edge. Soils are derived primarily from colluvial materials.

**Soil Characterization**

Soil pedons were characterized by the soil horizons at each sampling location. All profile descriptions were recorded on standard NRCS forms and are provided in Appendix D within Appendix 2-3. The soil horizons at each sampling location were sampled and characterized according to the State of Utah Division of Oil, Gas and Mining (DOGM) guidelines for topsoil and overburden[1]. Sampled parameters included: soil texture; pH; organic matter percent; saturation percent; electrical conductivity; $CaCO_3$; soluble potassium, magnesium, calcium and sodium; sodium absorption ratio, and extractable selenium and boron. Available water capacity, alkalinity, total nitrogen and available phosphorus were not analyzed at this time; these parameters can be tested at reclamation time. Organic matter percent was substituted for organic carbon. Soil texture by hand-texture method, rock fragment content (% by volume), and Munsell

[1]Leatherwood, J., and Duce, D., 1988. Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. State of Utah Department of Natural Resources, Division of Oil, Gas and Mining.

color were determined in the field by Mr Larsen. Generalized soil properties, including percent surface stones and boulders, are summarized as follows for each soil type:

| Map Unit | %Surface Stones & boulders | Soil Depth | % Slope | Permeability | Water Erosion Potential |
|---|---|---|---|---|---|
| SBG | 3-8 | Very Deep >60" | 5-15 | Moderate to Moderately rapid | Moderate low |
| VBJ | 8-20 | Very Deep >60" | 5-15 | Moderately rapid | Moderate low |
| XBS | 20-40 | Very Deep >60" | 10-45 | Moderately rapid | Low to moderate |
| DSH | <2 | Very Deep >60" | 3-8 | Moderately rapid | Moderate |
| RBL | >50 | Shallow to Deep | 20-70 | Slow to moderately rapid | Severe on shale, Low on rock |
| RBT | >50 | Shallow | 30-100 | Slow to moderately rapid | Severe to Low |

Soil samples were sent to Inter-Mountain Laboratories, Inc. for analysis. Appendix C of Appendix 2-3 contains the laboratory data sheets for all analysis on the 22 samples and duplicate analysis. Overall, soil laboratory test results show a good rating for soil materials, except as noted below:

- **pH** was high (rated poor) in only one sample - LC3, 24-48" with pH 8.6. Sample LC4, 40-58" had a pH of 8.2, which is rated fair to good. All other samples tested from pH 7.1 to 8.0 for a good rating.

- **Electrical Conductivity** and **SAR** were high in samples LC3 48-55" and LC5 40-58". For sample LC3 48-55", the SAR was 18 with an EC of 2.48. Since the SAR is greater than 15, soil materials below 48 inches are considered unacceptable. For sample LC5 40-58", the SAR measured 15 with an EC value of 8.89 mmhos/cm. The SAR is rated unacceptable for coarse textured soils and the EC is rated poor; therefore, soil materials below 40 inches are considered marginal at best.

  Sample LC10 0-4" had an EC of 2.58 mmhos/cm which has a rating of fair. All other samples had EC values ranging from 0.29 to 4.0 mmhos/cm, which is rated as good.

- **Soil textures** classified as sandy loam, except for samples LC1 3-10" and LC10 0-4" which were sandy clay loam and silt loam respectively. Based on soil texture, all soils tested are rated as good for reclamation material.

- **Available water holding capacity** values ranged from good to poor. The majority of samples were rated as fair; with LC1 0-3" rated poor; and LC1 10-23", LC5 29-40", LC5 40-58", and LC6 5-18" rated good.

- **Soluble boron** tested at less than 5.0 mg/kg on all samples, resulting in a good rating.

- **Extractable selenium** content tested at 0.2 mg/kg or less, which is considered good since all readings are less than 0.10 mg/kg.

- **Organic matter** content is relatively low in these soils. Generally, the surface soils ranged between 1.0 to 1.5 percent organic matter and the subsoils were about 0.5 percent.

- A **calcic horizon** was verified in soil pedons LC1, LC5 and LC6 with $CaCO_3$ ranging between 20 to 21 percent. Pedons LC3 and LC4 have some $CaCO_3$ accumulation in the subsoil but is less than the 15 percent needed to be classified as a calcic horizon.

- **Soluble magnesium** exceeded soluble calcium below depths of 30 inches. In general for these samples, the soluble calcium decreases and magnesium increases with depth.

  Normally, higher ratios of calcium to magnesium exist in soil solutions. Calcium is retained much more readily than magnesium on soil colloid exchange sites, resulting in the total amount of calcium in soils exceeding that of magnesium. However, the cross-over can occur were calcium is being removed from the soil solution by calcium carbonate precipitation, which explains the higher magnesium level in the lower soil horizons containing higher levels of calcium carbonate.

- Every effort should be made to minimize mixing the deeper subsoils containing extremely higher rock content with the surface soils and shallow subsoils containing lower amounts of rock. The **percent rock content** within the mine site disturbance or proposed facilities area is the main deterrent for soil suitability based on the current DOGM guidelines. Although DOGM suitability criteria considers >30% (by volume) rock fragments (for both gravels <3" in size and cobbles 3 to 10" in size) to be unacceptable, and >10% stones and boulders >10" in size to also be unacceptable, the recent trend by DOGM is to salvage **native soils** with **intrinsic or indigenous rock content.** Appendix 2-3 reports that native soils can be salvaged containing a higher rock content than the DOGM guidelines deems acceptable. Using these natural rocky soils should enhance reclamation success by providing an environment similar to native conditions. However, higher rock content greater than is present in the surface soils

needs to be avoided. Natural, intrinsic rock content provides for a more stable reclaimed surface, aids in water harvesting and water holding capacity of interstitial soils, and creates wildlife habitat and niches on the surface were surface boulders and larger cobble sized rocks are placed.

**Substitute Topsoil**

The PAP does not propose any borrow as a source for substitute topsoil.

**Findings:**

Information provided in the application is not considered adequate to meet the requirements of this section of the regulations. The applicant must provide the following in accordance with:

**R645-301-222 through R645-301-222.300,** Appendix 2-2 does not contain information for the RZH soil map unit which is shown on the general Order 3 soil map 2-1 as located within the Permit Area "B" for Lila Canyon boundary.

**R645-301-141,** The Order 1 soil survey map, both in Appendix 2-3 and on Plate 2-2, and the Salvageable Soils Map, Appendix A2 of Appendix 2-3, have discontinuous 25 feet contour lines within the surface disturbance area. Present this map with continuous contour lines.

# OPERATION PLAN

## TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-230.

**Analysis:**

Chapter 2, Soils, Sections 230 through 234, discusses the soil's operation plan for the proposed Lila Canyon Mine. Topsoil protection uses traditional methods of salvaging and stockpiling. The plan contains no measures for subsoil protection. The Analysis section discusses operation information as follows:

- Topsoil and Subsoil Removal
- Topsoil Substitutes and Supplements
- Topsoil Storage

**Topsoil and Subsoil Removal**

The following three points are summarized concerning topsoil and subsoil removal:

1. The plan proposes salvaging 43,000 cubic yards of topsoil with an average salvage depth of eight inches.
2. The proposed 43,000 cubic yards of topsoil salvage does not meet the reclamation needs within the Lila Canyon Mine disturbed area.
3. Reclamation needs are determined by revegetation requirements and include:
   - Replacing rooting-depth subsoils. Rooting-depth subsoil is defined as the subsoil depth containing many to common fine to very fine roots. These depths vary from 6 to 48 inches across the site, depending on the soil as shown in the Order 1 soil survey.
   - covering the refuse pile and mine development waste-rock with four feet of best available material.
4. There are adequate salvageable soil resources available within the disturbed area to meet reclamation needs, but the plan does not propose salvaging these currently undisturbed and available soil materials.

*Reclamation Needs - Soil Replacement Volumes*

| Soil Replacement Reclamation Needs | Acres | Soil Depth (inches) | Soil Volume (cubic yards) |
|---|---|---|---|
| Rock Slope Storage | 3.28 | 40& | 17,639 |
| Refuse Pile | 1.69 | 40& | 9,088 |
| Topsoil* | 38.95^ | 8 | 41,893 |
| Rooting Depth Subsoil** XBS | 8.89^ | 4& | 4781 |
| Rooting Depth Subsoil** RBL | 7.01^ | 0& | 0 |
| Rooting Depth Subsoil** RBT | 0.9^ | -2& | -242 |
| Rooting Depth Subsoil** SBG | 7.8^# | 40& | 41,947 |
| Rooting Depth Subsoil** DSH | 1.56^ | 18& | 3,775 |
| Rooting Depth Subsoil** VBJ | 9.51^ | 10& | 12,786 |
| Total | | | 131,667 |

* Since the A horizons are less than six inches, the plan has identified topsoil as 8 inches.
** Subsoil (> 8 inches) containing many to common fine and very fine roots.
^ Excludes undisturbed islands
# Excludes rock slope storage area

*Available Soil Resources - Soil Salvage Volumes*

The order 1 soil survey identifies 140,789 cubic yards of soil available for salvage from the site which more than adequately supplies the soil volumes needed to meet reclamation needs (131,667 cubic yards).

Based on DOGM guidelines and the Order 1 soil survey, Appendix 2-3 identifies and quantifies Topsoil suitable for reclamation. As summarized, soil salvage estimates are broken down according to soil survey map units. Based on the entire area within the disturbed area boundary, the Order 1 soil survey identified 157,600 cubic yards of available soil for salvage from 49 acres to an average depth of 24 inches. Several undisturbed islands are proposed and effectively reduce the disturbed acreage; of the 49 acres within the disturbed boundary, 39 acres are proposed to be disturbed. Therefore, the PAP identifies 140,789 cubic yards of available soil for salvage from 38.95 acres. The following table for salvage areas, acreage, depth of salvage and available volumes was :

**Topsoil Areas and Available Salvage Volumes**

| Map Unit | Salvage (inches) | Acres | Volume ($yd^3$) |
|---|---|---|---|
| SBG | 48 | 11.08 | 71,501 |
| VBJ | 30 | 9.51 | 38,336 |
| XBS | 12 | 8.89 | 14,307 |
| DSH | 40 | 1.56 | 8,373 |
| RBL | 8 | 7.01 | 7,543 |
| RBT | 6 | 0.90 | 729 |
| Total | | 38.95 | 140,789 |

Potential salvage depths were generated for each map unit based on evaluations of all field and laboratory data, and plant rooting depth. Soil salvage areas are broken down by soil survey map units and are identified on the Salvageable Soils Map, Appendix A2 of Appendix 2-3, Order 1 Soil Survey. The Salvageable Soils Map shows each soil survey map unit, soil description sites, and potential salvage depths. Depths of suitable soil material potentially available for soil salvage from each of the soil units within the surface disturbance area are listed in the following table as compared to rooting depth and subsurface rock content:

| Map Unit | Salvageable Soil Layer (inches) | Many to Common Fine Roots Rooting Depth (inches) | Subsurface Rock Within Soil Salvage Layer (percent) |
|---|---|---|---|
| SBG | 48 | 48 | 10 to 65 |
| VBJ | 30 | 18 | 5 to 65 |
| XBS | 12 | 12 | 25 to 40 |
| DSH | 40 | 26 | <5 to 45 |
| RBL | 8 | not listed | 30 |
| RBT | 6 | 6 | 35 |

*Topsoil Salvage Practices*

State regulations R645-301-232.100 are specific in requiring that all topsoil be removed from the area to be disturbed. Since the topsoil is less than six inches, the PAP defines "Topsoil" as suitable soil for plant growth, generally, the upper 6 to 12 inches that consist of both the A and B horizon materials. Therefore, topsoil salvage will include the topsoil and the B horizon material immediately below the topsoil and the mixture will be treated as topsoil. Section 232.100 of the PAP concludes that actual topsoil salvage will average 8 inches over the 40 acres of disturbed area, which will result in a total volume of about 43,000 cubic yards of soil. Large stones and boulders are considered part of the soil layer and are included in the topsoil volume estimates. Plate 2-3 shows an average of 8 inches being salvaged across the site. Topsoil salvage will occur under the supervision of a soil scientist.

Topsoil salvage at the proposed exhaust fan site located near the coal outcrop will be stored on-site, in the immediate disturbance area for fan installation. The proposed fan site is at an elevation of about 6400 feet and is located on a narrow bench, with a slope of about 40 to 45 %. The soil survey identifies an approximate salvage depth of 6 inches for the RBT soils.

Topsoil salvage sequence will generally start at the lower elevations of the site and then proceed up slope ahead of construction. The PAP shows the undisturbed islands within the disturbed area where no surface disturbance will occur; and therefore, no topsoil salvage will occur in these areas. *The PAP needs to identify what measures will be made during the life of the mine to protect undisturbed topsoil resources from mining related impacts, such as blowing coal fines, vehicle traffic, and other uses that would disturb and/or otherwise negatively impact these undisturbed areas and topsoil resources.*

*Subsoil Segregation and Salvage Practices*

PAP Section 232.100 states that after topsoil removal, underlying subsoil will be used as fill or left in place. Below the upper 6 to 12 inches of topsoil, there is generally an increase in carbonates and rock. The PAP states that although these lower subsoils support plant roots, they are not considered as substitute topsoil in this case. Below the possible salvageable depths as listed for each soil, there is generally an additional large increase in rock content, upwards to 70 and 80 percent rock. Within the RBL and RBT soil areas, Mancoes is encountered immediately below the shallow soils. In no case, should Mancoes be salvaged with the overlying soils.

*State R645-301-200 regulation states that soil salvage includes both the surface topsoil and subsoils as based on the soil survey and re-vegetation requirements. R645-301-232.500 states that the Division may require that the B horizon, C horizon, or other underlying soils be removed and segregated, stockpiled, and redistributed as subsoil if it finds that such subsoil layers are necessary to comply with the re-vegetation requirements of R645-301-353 through R645-301-357. Salvage of subsoils is based on subsoil replacement rooting depth and soil suitability criteria established in the Order 1 soil survey.*

*Adverse Conditions*

Sections 232.700 and 232.710 state that topsoil can be salvaged on areas to be disturbed. Local exceptions may exist where topsoil can not be salvaged because of rockiness and/or steep slopes. *The PAP needs to specifically discuss and identify areas on the soil salvage map where conditions exist that preclude soil salvage due to rockiness and/or steep slopes. If steep slopes are accessible to construction machinery for constructing cutslopes, soils are expected to be salvaged. On extremely bouldery surfaces planned for disturbance, underlying soils are expected to be salvaged. Either steep, rocky surface slopes are safe for constructing cut slopes and likewise soil salvage, or they're not safe for either activity. If steep, rocky slopes and extremely bouldery surface materials render themselves suitable for constructing purposes using conventional construction equipment, (e.g., cutslopes, sediment pond basins, and pad fill), then these same indigenous soil and rock material from the unconsolidated steep, rocky surfaces can be salvaged and stockpiled for later reclamation use.*

*There is no clear and obvious presentation in the PAP where cut and fill slopes will occur as described in the text. The PAP needs to provide a cut and fill contour map and correlate discussion from both operation and reclamation activities.*

*Rocks - Boulders and Large Stones*

Robert Davidson's discussion concerning salvaging soils with higher rock content has been misrepresented in the Appendix 2-3, Section 2.5, Soil Suitability For Salvage. The general idea is to salvage otherwise suitable soil containing indigenous amounts of rock that are typical

within the soil salvage area. The main idea is that native soils with a higher intrinsic rock content than Division guideline deems acceptable, offer a greater potential for reclamation success as follows:

4. allow a greater potential for moisture infiltration into the interstitial soils
5. provide for a more stable reclaimed surface
6. provide additional surface cover in sparsely vegetated areas, thus helping protect against rain drop impact and resulting soil surface erosion
7. create wildlife habitat niches
8. create micro-climates for plant establishment and vegetation survival.

The PAP appendix 2-3 states that surface stones and boulders in the soil that are present during salvage operations, could be removed to a rock pile on site and held there until replacement. Protection of topsoil resources include salvaging "**native soils**" with "**intrinsic or indigenous rock content.**" Section 232.100 states that boulders of approximately three feet in diameter and larger will be separated from the topsoil and piled or placed at appropriate locations. Clarify the following in the PAP:

- *Designate a "topsoil" rock stockpile on maps where salvaged rock will be stored for reclamation use.*
- *"Topsoil" rock stockpiles need to be appropriately signed and protected during life of mine.*
- *Or, include rock with soil salvage and store with soil in topsoil stockpile.*

**Topsoil Substitutes and Supplements**

Sections 224, 231.200, 232.720, 233, and 233.100 thru 233.400 state that no topsoil borrow nor substitute topsoil is needed.

*Rock Slope Material*

Using R645-100, the rock slope material is by definition Underground Development Waste which is by definition Coal Mine Waste. All Coal Mine Waste must be properly disposed of in a Refuse Pile. A Refuse Pile means a surface deposit of coal mine waste that does not impound water, slurry, or other liquid or semi-liquid material. Underground Development Waste is Defined by R645-100 as waste-rock mixtures of coal, shale, claystone, siltstone, sandstone, limestone, or related materials that are excavated, moved and disposed of from underground workings in connection with Underground Coal Mining and Reclamation Activities. *Therefore, the rock slope waste material must be identified as Underground Development Waste and disposed of properly as a Refuse Pile.*

*Refuse Piles*

The PAP states that the refuse pile will be covered with 24 inches of subsoil and 8 inches of topsoil, for a total of 32 inches. *Since this is not a case of pre-law disturbance without enough suitable soil resources, the plan must provide for a minimum of 48 inches of cover using the best available material according to the requirements of R645-301-533.252. The Order 1 soil survey shows that adequate soil resources are available to attain the needed volume of soils, which are the best available material. Therefore, enough topsoil and subsoil need to be salvaged and stockpiled to meet the 4 foot cover requirement for both the rock-slope refuse pile and the main refuse pile.*

*Section 232.500 and Appendix 5-7 state subsoil will be removed from RBL area to minimum depth of 24 inches. The Order 1 soil survey, test pit LC10, shows that topsoil cover is approximately 6 to 8 inches and that immediate subsoils 6 inches and greater in depth contain 65 to 80 percent Mancos shale fragments. Only suitable topsoil and subsoil may be salvaged and used for reclamation; Mancos has not been approved for salvage.*

**Topsoil Storage**

The application states that the topsoil stockpile will be located and protected to avoid contamination and unacceptable compaction. The plan further states that the slopes will have an irregular, pitted surface or contour furrows to help retain precipitation and minimize runoff. The following are needed:

- *Soil scrappers have been shown to induce soil compaction. State how compaction will be alleviated.*

- *Section 234.230 states that surface roughening will consist of contour furrows and constructing an irregular, pitted surface. These two practices are not compatible. Commit to using one or the other exclusively. If contour furrows are used, engineer furrow placement, slope, and size to control erosion; provide contour furrow design, maps, and cross sections.*

The application, Section 232.100, contains information concerning topsoil pile size and dimensions. However, additional information is needed as follows:

- *Topsoil Stockpile - Size the topsoil to store the 43,000 CY of topsoil as identified in the PAP.*

- *Subsoil Stockpile - Size the subsoil pile to store the additional 98,000 CY of subsoil as identified in the PAP. Provide the location and placement of the subsoil stockpile.*

- *Stockpiles - Provide engineered drawings of projected stockpiles, showing size, exact placement, final configuration and cross sections of each stockpile. Details are needed for the following stockpiles:*
  - *topsoil stockpile,*
  - *subsoil stockpile, and*
  - *"topsoil" rock (boulders and large stones) stockpile.*

**Findings:**

Information provided in the application is not considered adequate to meet the requirements of this section of the regulations. The applicant must provide the following in accordance with:

**R645-301-232.100 through R645-301-232.500,** The total volume of soil needed for reclamation (131,667 cubic yards) will require salvaging and protecting most of the available topsoil and rooting-depth subsoil resources within the disturbed area as identified in the Order 1 soil survey. All topsoil and rooting-depth subsoil resources must be protected and/or preserved for reclamation. Topsoil and rooting-depth subsoils may not be mixed or contaminated with unsuitable soil materials containing excess rock or Mancoes shales.

**R645-301-333,** Identify what measures will be made during the life of the mine to protect the island of undisturbed topsoil resources from mining related impacts, such as blowing coal fines, vehicle traffic, and other uses that would disturb and/or otherwise negatively impact these undisturbed areas and topsoil resources.

**R645-301-232.700 and R645-301-232.710,** Identify specific areas inaccessible for construction machinery where soils can not be salvaged due to adverse, unsafe or impractical conditions. All soils must be salvaged on steep slopes and/or rocky areas accessible to construction machinery for the purpose of constructing cut slopes or grading flat areas.

**R645-301-120 and R645-301-140,** Clearly identify, locate, and present where cut and fill slopes will occur as described in the text. Provide a cut and fill contour map correlated with discussions from both the operations and reclamation sections.

**R645-301-231.100 through R645-301-232.300, and R645-301-234.100 through R645-301-234.240,** Section 232.100 states that boulders of approximately three feet in diameter and larger will be separated from the topsoil and piled or placed at appropriate locations. The following need clarification in the PAP:

- Designate a "topsoil" rock stockpile on maps where salvaged rock will be stored

for reclamation use, and sign these piles accordingly during the life of the mine.

- Or, include rock with soil salvage and store with soil in topsoil stockpile.

**R645-301-100 (Underground Development Waste, Coal Mine Waste, Refuse Pile), R645-301-528.200 through R645-301-528.322, and R645-301-536 through R645-301-536.900,** Identify the rock-slope waste material as Underground Development Waste. Place and properly dispose of all Underground Development Waste in a Refuse Pile. If Underground Development Waste is used as pad fill, then the pad fill must meet the permit requirements for an approved disposal area.

**R645-301-553.252,** The PAP states that the refuse pile will be covered with 24 inches of soil. Correct the PAP so that the refuse pile, upon final grading is covered with a minimum of four feet of the **best available**, nontoxic and noncombustible material.

**R645-301-553.252 and R645-301-233,** Section 232.500 and Appendix 5-7 state subsoil will be removed from RBL area to minimum depth of 24 inches. The Order 1 soil survey, test pit LC10, shows that topsoil cover is approximately 6 to 8 inches and that immediate subsoils 6 inches and greater in depth contain 65 to 80 percent Mancos shale fragments. Only suitable topsoil and subsoil may be salvaged and used for reclamation; Mancos has not been approved for salvage.

**R645-301-234.220 through R645-301-234.230,** The application states that the topsoil stockpile will be located and protected to avoid contamination and unacceptable compaction. The plan further states that the slopes will have an irregular, pitted surface or contour furrows to help retain precipitation and minimize runoff. The following are needed:

- Soil scrappers have been shown to induce soil compaction. State how compaction will be alleviated.

- Section 234.230 states that surface roughening will consist of contour furrows and constructing an irregular, pitted surface. These two practices are not compatible; commit to using one or the other exclusively. If contour furrows are used, engineer furrow placement, slope, and size to control erosion; provide contour furrow design, maps, and cross sections.

**R645-301-234.200 through R645-301-234.240, R645-301-521.160, R645-301-521.165,** Additional information is needed concerning soil stockpile pile size and dimensions.

- Topsoil Stockpile - Size the topsoil to store the 41,893 CY of topsoil as identified in the PAP.

- Subsoil Stockpile - Size the subsoil pile to store the additional 89,774 CY of subsoil as identified in the PAP. Provide the location and placement of the subsoil stockpile.

- Stockpiles - Provide engineered drawings of projected stockpiles, showing size, exact placement, final configuration and cross sections of each stockpile. Details are needed for the following stockpiles:
  - topsoil stockpile,
  - subsoil stockpile, and
  - "topsoil" rock (boulders and large stones) stockpile.

# RECLAMATION PLAN

## TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-240.

**Analysis:**

Chapter 2, Soils, Sections 240 through 244, discusses the soil's reclamation plan for the proposed Lila Canyon Mine. The Analysis section discusses reclamation information as follows:

- Soil Redistribution
- Soil Nutrients and Amendments
- Soil Stabilization

**Soil Redistribution**

The Permit Application Package describes the steps taken for reclamation. Reclamation will begin once all surface facilities and structures have been demolished and removed. Cut areas will be backfilled and graded to approximate original contour (AOC) using fill material taken from pad fill areas. Reclamation of slopes will take place in vertical increments (lifts) simultaneously with the reclamation of the pad area in corresponding lifts. The adjacent hillside will be reclaimed and revegetated. Furthermore, the plan states that much of the revegetation efforts on these slopes can be accomplished by using the adjacent pad fill areas as a work platform for equipment and materials. *The following are needed:*

- *The location of cut and fill slopes is not clear. Please provide a cut and fill contour map to correlate with the discussion concerning backfilling cut slopes from adjacent pad areas.*

- *Clarify which adjacent pad areas (located within the disturbed area) will be used as work platforms for backfilling cut slopes and newly exposed hillsides.*

- *The statement that the adjacent reclamation pad area will be reclaimed in corresponding lifts is unclear since the pad is being removed, not built up.*

Section 242 states that after AOC is achieved, the surface will be prepared. Pocking will be the primary method for roughening the AOC surface. Pocking is described as imprinting the soil surface with a pattern of depressions measuring approximately 18 inches by 24 inches by 8 inches deep. This would be an absolute minimum for pock size. The best available technology will be used for enhancing the ability of the soil to absorb moisture. *Clarification is needed as follows:*

- *Describe whether Pocking will occur before or after topsoil placement.*

- *Describe the density of pock placement on the soil surface.*

Section 242.100 states that previously stockpiled topsoil will be redistributed on the same areas in a uniform thickness of approximately 8 inches on the scarified, postming regraded fill surface. On flat areas, soil will be reapplied using road grader and/or crawler tractor. On steep slope areas, soil will be reapplied using a front-end loader, crawler tractor, and/or trackhoe. Soil will be applied in horizontal lifts. Boulders will be replaced to achieve a near natural surface condition. Alleviating or minimizing soil compaction is not discussed. *The following are needed:*

- *A description of methods for minimizing and alleviating compaction of fill and replaced subsoil and topsoil.*

- *A description of methods for reducing soil slippage between the fill and soil interface.*

- *A plan for the reincorporation of stockpiled rock (boulders and large stones) with the redistributed topsoil.*

**Soil Nutrients and Amendments**

Sections 231.300 states that topsoil will be sampled, as it is hauled from the storage piles, and tested for nitrogen, phosphorus and potassium content. One grab samples will be taken from each truck load. Field measurements will be used for pH and EC parameters to allow immediate identification of salinity problems and acid problems. If problems are identified in the field, additional sampling will better define the extent and nature of the problem. Section 243 states that topsoil will be sampled and tested prior to replacement. Grab samples will be collected from

the stockpile at various locations and depths. *Section 231.300 and 243 are not in complete agreement on topsoil sampling procedures. Sections 231.300 and 243 refers to topsoil field sampling and testing. Please ensure that all sampling, testing and result interpretation is done by a qualified soil scientist. The soil scientist must be qualified to sample, test and interpret data results. Prior to sampling and testing of the topsoil material, the soil scientist's qualifications must be reviewed by the Division.*

Section 243 states that based on laboratory analyses, nutrients and soil amendments will be added to make the redistributed soil similar to the undisturbed soils and aid in establishment of vegetation cover. The plan states that the nutrients and amendments can be added by hydroseeding, broadcasting, or by drilling. If the nutrients and amendments are broadcast to the ground surface, they will be mixed with the soil by discing or raking. *Drilling, discing or raking are not compatible with extreme rocky soils, rocky surfaces, or with surfaces that have been deep gouged or pocked. Correct the plan to indicate surface preparation practices that are compatible with the rocky soil and surfaces, and that are consistent with other reclamation practices (e.g., pocking).*

**Soil Stabilization**

Section 244.100 states that vegetation will be the primary method for controlling erosion and fugitive dust. Other measures that will help in erosion control and soil stabilization is pocking and rock placement.

Section 244.200 states that pocking will be the primary method used to roughen the soil surface. In addition, wood fiber mulch will be applied at a rate of 2,000 pounds per acre to the reclaimed areas that have been regraded and covered by topsoil or substitute topsoil. The wood fiber mulch will be tacked to the surface with a tackifier.

**Findings:**

Information provided in the application is not considered adequate to meet the requirements of this section of the regulations. The applicant must provide the following in accordance with:

**R645-301-120,** The following items are needed to help add clarity and eliminate discrepancies in the plan:

- The location of cut and fill slopes is not clear. Please provide a cut and fill contour map to correlate with the discussion concerning backfilling cut slopes from adjacent pad areas.

- Clarify which adjacent pad areas (located within the disturbed area) will be used

as work platforms for backfilling cut slopes and newly exposed hillsides.

- The statement that the adjacent reclamation pad area will be reclaimed in corresponding lifts is unclear since the pad is being removed, not built up.

**R645-301-242, R645-301-244,** Clarify and describe soil redistribution, placement, and stabilization:

- Describe whether Pocking will occur before or after topsoil placement. Describe the density of pock placement on the soil surface.

- Describe methods for minimizing and alleviating fill and replaced subsoil and topsoil compaction.

- Describe methods for reducing soil slippage between the fill and soil interface.

- Describe how stockpiled "topsoil" rock (boulders and large stones) will be placed on the surface and reincorporated with the redistributed topsoil.

- Correct the plan to indicate surface preparation practices that are compatible with the rocky soil and surfaces, and that are consistent with other reclamation practices (e.g., pocking). Drilling, discing or raking are not compatible with extreme rocky soils, rocky surfaces, or with surfaces that have been deep gouged or pocked.

**R645-301-130,** Section 231.300 and 243 are not in complete agreement on topsoil sampling procedures. Sections 231.300 and 243 refers to topsoil field sampling and testing. Please ensure that all sampling, testing and result interpretation is done by a qualified soil scientist. The soil scientist must be qualified to sample, test and interpret data results. Prior to sampling and testing of the topsoil material, the soil scientist's qualifications must be reviewed by the Division.